Toxic Substances: What We Knew Then, What We Know Now

Student Worksheet

A. Define the following terms:

Carcinogen _____

Teratogen _____

Bioaccumulation _____

Toxin _____

Toxicant _____

Dose _____

Tolerance _____

Metabolism _____

B. Following are examples of *antagonism*, *synergism*, and *promotion*. Put the appropriate name beside each example:

1. _____ Smokers who, during their work, are exposed to asbestos (a risk factor for lung disease) have a much higher than expected risk of lung cancer.

2. _____ In experiments, croton oil had no effect on mice. However, if the mice were exposed to carcinogens, more tumor development was observed in those who were also exposed to croton oil after the carcinogens.

3. _____ Calcium reduces the absorption of lead by the body.

C.

1. List three ways chemicals may enter the body.

   _____

2. In many workplaces, there may be potentially dangerous chemicals in the air. Suggest two ways that workers' exposure to such contaminants may be limited.

   _____

3. Farmers do much of their work outside. Does this protect them from airborne contaminants? Explain your answer.

   _____

4. Rhubarb contains oxalates, compounds which bind calcium so that it is unavailable to the body. In high doses, it may be dangerous.

   a. Calcium plays an important role in muscle contraction. What else is calcium used for?

   _____

   b. Dan loves rhubarb pie. Should he adjust his diet in spring when he usually eats a lot of rhubarb?

   _____

   c. Many foods contain compounds which may be toxic if high levels are eaten. How should this knowledge affect our food choices?

   _____

5. Alcoholic beverages contain ethyl alcohol. To detoxify ethyl alcohol, the alcohol dehydrogenase causes a reaction in which alcohol is changed to acetaldehyde (CH_3CHO). This is converted by the aldehyde dehydrogenase to acetic acid, which is eventually converted to carbon dioxide and water and excreted from the body. Acetaldehyde causes symptoms of hangover. Most alcohol metabolism takes place in the liver. Excess consumption of alcohol may lead to liver damage and accumulation of at in the liver. This often leads to liver disease in alcoholics.

   Hydrogen peroxide (H_2O_2) is produced by organic oxidations within the peroxisome, a cell organelle found prominently in liver and kidney tissue. Since hydrogen peroxide is also toxic, the enzyme catalase causes it to be broken down to water and oxygen. Catalase can also cause some oxidation of ethyl alcohol by hydrogen peroxide to produce acetaldehyde and water.

   a. Write balanced equations for the two catalase reactions.

   _____

   b. What will be the effect of drinking on individuals who do not produce the aldehyde dehydrogenase **enzyme**?

   _____

   c. If a person suffers from kidney or liver disease, would this affect the body's ability to deal with toxicants such as alcohol?

   _____